Remarks

The above-referenced application has been reviewed in light of the Examiner's Final Office Action dated July 25, 2006. Claims 1 and 5-21 are currently pending in this application. The Examiner's reconsideration of the rejections is respectfully requested, particularly in view of the following remarks.

In accordance with the Office Action, Claims 1 and 5-21 stand rejected under 35 U.S.C. § 102(b) as being anticipated by IEEE Publication Number 1080-1820/97 to Pasko et al., which is entitled "Optimization Method for Broadband Modem FIR Filter Design using Common Subexpression Elimination" ("Pasko '97").

Applicant's previously presented Claim 1 recites, *inter alia,* a "virtual common subexpression **not originally common to any filter coefficients** ... wherein the virtual common subexpression has **a single bit shifted, added or inverted** relative to the predetermined common subexpression" (**emphasis** added). Applicant defined the term "virtual common subexpression" in the application as originally filed (*see* Application at p.12, line 27 through p.13, line 2). Thus, a "virtual common subexpression not originally common to any filter coefficients" is a subexpression that was not originally common to any filter coefficients, but was instead realized "by using an existing ... subexpression" that is "bit-shifted, bit-added, or bit-inverted ... into an artificial ... (or) virtual common subexpression" (*Id.*). The meanings of "bit-shifted", "bit-added" and "bit-inverted" were described in the specification with respect to Figures 4, 5 and 6, respectively,

as being **single** bit operations to synthesize a virtual common subexpression not originally common to any filter coefficients from an existing subexpression.

For example, Applicant describes an embodiment with respect to Figure 4 (*see* Application at p. 13, line 11 through p. 16, line 16). Here, the zero delay coefficient h0 is used for the predetermined subexpression, and the non-zero delay coefficients h1 through h13 are each realized with virtual common subexpressions by applying only a single bit operation to the subexpression h0.

The Pasko '97 reference is generally directed towards optimization of a transpose form FIR filter with constant coefficients by an exhaustive search brute force method per design iteration (*see* Pasko at sections I, IV.3 and IV.4). Pasko '97 performs a type of exhaustive search per design iteration for common multi-bit patterns in the delay coefficients, and may perform a statistical analysis to determine which of the common multi-bit patterns should be eliminated, and/or in which order.

The Examiner relies entirely on the Pasko '97 reference to anticipate Applicant's "virtual common subexpression not originally common to any filter coefficients ... wherein the virtual common subexpression has a single bit shifted, added or inverted relative to the predetermined common subexpression", as recited in previously presented Claim 1. Such reliance is misplaced.

Applicant presented exemplary conventional systems in Figures 1-3. Although Pasko '97 may go beyond the exemplary conventional systems of Applicant's Figures 1-3 by repeating its exhaustive search for common multi-bit

patterns **per design iteration**, Pasko fails to teach or suggest "wherein the virtual common subexpression has a single bit shifted, added or inverted relative to the predetermined common subexpression". *Arguendo,* even if one of Pasko's common multi-bit patterns is considered to be a predetermined common subexpression as specified by Applicant, said common multi-bit pattern would require much more than "a single bit shifted, added or inverted" to reach the virtual common subexpressions used by Applicant to represent each of the other coefficients (e.g., Applicant's h1 through h13) not already represented by the predetermined expression (e.g., Applicant's h0). *See, e.g.,* Application at p. 13, line 13, lines 21-26; p.14, lines 1-6.

Pasko '97 shows the use of subexpressions that are originally common to some filter coefficients as discussed by Applicant in the Background section of the application as originally filed (*see, e.g.,* Application at page 22, line 22 through page 23, line 10; *Id.* at Prior Art Figure 9). While it may be true that after Pasko's first design iteration, the intermediate results might not have been originally common to some of the original filter coefficients, it is respectfully submitted that any such intermediate results do not (or no longer) qualify as the "predetermined common subexpression" as described and claimed by Applicant. Pasko fails to address, much less teach or suggest both a "virtual common subexpression not originally common to any filter coefficients" and that a "virtual common subexpression has a single bit shifted, added or inverted relative to the predetermined common subexpression" as presently claimed and originally

disclosed by Applicant (*see, e.g.,* Application at p.12, line 27 through p.13, line 2; p.23, line 11 through p.24, line 22; *Id.* at Figure 8).

The method of Pasko '97 is one of several methods known in the art for predetermining or preselecting a locally optimized subset per design iteration of the existing common subexpressions that are common to some filter coefficients to reduce adders, for example. On the other hand, Applicant's disclosure of virtual common subexpressions not originally common between any two filter coefficients can further reduce the number of adders beyond what was contemplated by conventional search methods, including those of Pasko et al., since Applicant teaches more than just searching for common subexpressions, but synthesizing virtual common subexpressions from a single predetermined subexpression.

Applicant's exemplary embodiment of Figure 8 shows a virtual common subexpression not originally common to any filter coefficients. The resulting digital filter uses 21 fewer adders than the conventional example of Figure 9. The conventional example of Figure 9 is like the Pasko '97 reference in that a common subexpression that is originally common to some filter coefficients is used to detect or select existing common subexpressions. Thus, embodiments of Applicant's presently claimed invention with virtual common subexpressions not originally common to any filter coefficients may be applied following a conventional common subexpression elimination to further reduce hardware and/or processing requirements. Applied alone, the method of Pasko et al. would not result in the "virtual common subexpression not originally common to any filter coefficients"

embodiment of Figure 8, for example, and as presently claimed.

Each of Claims 1, 7, 10, 11, 14 and 17-21 recite at least one of a "virtual common subexpression not originally common to any filter coefficients" and/or that a "virtual common subexpression has a single bit shifted, added or inverted relative to the predetermined common subexpression". Thus, each of Claims 1, 7, 10, 11, 14 and 17-21 is neither taught nor suggested by the Pasko '97 reference, whether taken alone or in combination with any of the other references of record in this case.

Conclusion

Accordingly, it is respectfully submitted that independent Claims 1, 7, 10, 11, 14 and 17-21 are in condition for allowance for at least the reasons stated above. Since the dependent Claims 5-6, 8-9, 12-13 and 15-16 each depend from the above claims and necessarily include the elements and limitations thereof, it is respectfully submitted that these claims are also in condition for allowance for at least the reasons stated, as well as for reciting additional patentable subject matter. All issues raised by the Examiner having been addressed, reconsideration of the rejections and an early and favorable allowance of this case are earnestly solicited.

Respectfully Submitted

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